REMARKS

Claims 89-94 and 99-110 are pending in this application. In the Final Rejection dated January 29, 2004, the Examiner (1) rejected claims 89-94 under 35 U.S.C. 103(a) as being unpatentable over Crevasse et al. (6,261,958) or Bowman et al. (6,244,941), alone or in view of Horowitz (5,325,261); (2) rejected claim 99 under 35 U.S.C. 103(a) as being unpatentable over Bowman et al. ('941), alone or in view of Horowitz ('261); and (3) rejected claims 100-110 under 35 U.S.C. 103(a) as being unpatentable over Crevasse et al. ('958) or Bowman et al. ('941) in view of Horowitz ('261).

Applicants disagree with these rejections and wish to clarify various distinctions of applicants' invention over the cited art. Reconsideration of the invention is therefore requested in light of the following remarks.

Withdrawal of Finality: As an initial matter, Applicants request withdrawal of the finality of the rejection as being prematurely issued. In the paper filed on December 19, 2003 in response to the office action dated November 4, 2003, Applicants presented arguments to rebut the obviousness rejections of the claims over Crevasse, Bowman and a reference entitled *Electro Chucks: Frequently Asked Questions*. No amendments were made to the claims with the response. In the present office action, the Examiner has rejected the same non-amended claims over newly cited art, more specifically, the rejection now stands over Crevasse or Bowman in view of Horowitz. The finality of this rejection is therefore improper pursuant to MEPE § 706(a), which provides in pertinent part:

> Under present practice, second or an any subsequent actions on the merits shall be final, *except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims nor based on information submitted in an information disclosure statement* filed during the period set forth in 37 C.FR 1.97(c) with the fee set forth in 37 CFR 1.17(p).

(Emphasis Added). In the present case, Applicant did not amend the claims nor is the rejection based on an IDS. Accordingly, the finality of the rejection is improper and should be withdrawn. If the Examiner disagrees, then Applicants request that the Examiner contact the undersigned attorney by telephone to discuss this matter further or with the Examiner's supervisor prior to issuing any advisory action and by all means prior to lapse of the 6 month response deadline date of July 29, 2004.

Applicants' Invention v. The Cited Art. In the remarks that follow, various technical differences between the references cited by the Examiner and the embodiments of the present invention are discussed. It is understood, however, that any discussion involving various embodiments of the invention, which are disclosed in detail in the applicants' specification, do not define the scope or interpretation of any of the claims. Moreover, any discussion of differences between the references cited and the various embodiments of the invention are intended only to help the Examiner to appreciate the importance of the claimed distinctions as they are discussed.

The disclosed invention is generally directed to methods and devices for releasably attaching a polishing pad to the platen of a planarization machine used to planarize a semiconductor wafer. In a pertinent embodiment, the platen of the planarization machine may include a conductive plate positioned within the platen that may be connected to an electrical signal source. The planarization medium may further include a support member that has a polishing pad attached to the support member. The electrical signal source may be a voltage capable of charging the conductive plate so that a planarization medium positioned adjacent to the conductive plate may be electrostatically attracted to the platen while the voltage is applied. As a result, the pad is retained on the platen by electrostatically attracting the support member to the platen. To augment the electrostatic attractive force, the support member may optionally include a locking device that engages a mating portion formed in the platen that resists vertical and/or lateral motion of the support member relative to the platen.

An additional embodiment of the disclosed invention includes a polishing pad having a plurality of conductive particles distributed within the pad that may be electrostatically or electromagnetically attracted to the platen. When the polishing pad is electromagnetically attracted to the platen, the electrical signal source includes an electrical current that passes through the conductive plate to produce the attractive force between the platen and the particles distributed in the polishing pad. The particles may be distributed in the pad in a uniform manner, or they may be non-uniformly distributed. For example, the particles in the pad may be concentrated in a portion of the pad that is adjacent to the platen in order to enhance the electromagnetic or electrostatic attractive forces between the pad and the platen.

In rejecting the claims identified above, the Examiner has cited the Crevasse reference, which discloses an electromagnetic polishing pad retention apparatus. Referring in

particular to Figure 3 of the Crevasse reference, the differences between the disclosed embodiments and the Crevasse apparatus are readily understood. Crevasse discloses and teaches an electromagnet 54 is positioned within a platen 40 that is coupled to a current source through a switch 56. The polishing pad 32 is attached to a backside layer 36 that is comprised of a magnetic material, such as a thin steel sheet (col. 5, lines 5-10). Accordingly, the backside layer 36 is attracted to the platen 40 when the electromagnet 54 is connected to the current source through the switch 56. The layer 36 is disclosed as a substantially planar member that is detachable from the platen by interruption of the current. The Crevasse reference, however, fails to disclose that the layer 36 may be replaced by a plurality of conductive particles distributed in the pad 32, as disclosed in an embodiment of present application. Further, Crevasse makes no mention of retaining the layer 36 on the platen 40 by means of electromagnetic attractive forces.

The Examiner has further cited the Bowman reference in rejecting the present claims. Bowman similarly discloses an electromagnetic polishing pad retention apparatus. With respect to the pertinent teachings in Bowman, the applicants respectfully assert that the disclosure of Bowman is substantially identical to the disclosure in the Crevasse reference, as will be briefly described. Referring to Figure 6, a plurality of electromagnetic elements 338 are positioned in the platen 328 that are coupled to a current source through a switch 340. A top plate member 332 is positioned on the platen 328, that further includes a polishing pad 326 that is attached to a surface of the member 332. When a current is applied to the electromagnetic elements 338, an electromagnetic attractive force is developed between the top plate member 332 and the platen 328. Bowman, however, also fails to teach that the member 332 may be replaced by a plurality of conductive particles distributed in the pad 326, or that the polishing pad may be retained on the platen by electrostatic attractive forces.

The Examiner has further asserted that applicants have disclosed that "...*either type of force will would work equally well.*". That is, an electrostatic means of attraction is equally interchangeable with an electromagnetic means of attraction. Applicants strenuously disagree. Applicants have made no such admission in the specification. The application as a whole discloses several dissimilar embodiments, including vacuum attraction as well as magnetic and electrostatic attraction. These are each fundamentally different embodiments based on

different attractive forces that have different properties as well as different advantages and drawbacks.

In this regard Applicants disagree with the characterization of Horowitz to support the Examiner's general position that it would be obvious to one of ordinary skill in the art to replace the means for generating an electromagnetic attractive force with the disclosed electrostatic force generation means or the means taught by Horowitz. Briefly and in general terms, it is well known that electrostatic forces are generated *in the absence of the movement of a current*, relying instead upon the imposition of a voltage that is calculated to generate the requisite degree of attraction. Conversely, the generation of electromagnetic forces relies exclusively on *the movement of a current through a conductor* to generate an attractive force, and further must act upon a ferromagnetic material in order to develop any sizeable attractive force. One advantage of electrostatic forces over magnetic forces in the present invention is that no current is generated in a conductive material (*i.e*, the conductive layers being planarized in semiconductor wafer) that is moved during the planarization process through the magnetic flux lines that would be generated at the poles of the platen and polishing pad, respectively .

On the other hand, the many disadvantages of using electrostatic forces are outlined in detail by Horowitz, at column 1, line 65 through column 3, line 9. One of these disadvantages purportedly solved by the teaching of Horowitz, is build up of a static charge on the surface of the wafer negating the gripping action of the electrostatic grip. In addition, the chuck described by Horowitz is not designed for movement of the wafer across a frictional surface, such as occurs in planarization, which would further tend to lossen the gripping power of electrostatic force. Moreover, the chuck described by Horowitz would not operate in a planarization process because in the electrostatic chuck described by Horowitz, the chuck assembly must be designed to have a deformation, or in the case of a flat chuck, must use a wafer that has an existing deformation for the electrostatic force to attract the wafer to the chuck. In this regard Horowitz teaches that:

> The gripping action in concert with the ridge 15 causes deformation of the wafer as it is pulled towards the surface 16 as illustrated in FIGS 1 and 2. The chuck and ridge 15 are dimensioned such that the deformation to the wafer 10 is not such as to cause undue stress in the wafer.

> Note that semiconductor wafer generally have an inherent bow, which means that the chuck surface may be flat while still allowing motion of the wafer in accordance with the present invention. (Column 6, lines 44-52)

In the context of planarization of a wafer, the goal is to make the surface absolutely flat. The type of electrostatic chuck taught by Horowitz would, if implemented for a planarization process, tend to deform the polishing pad, frustrating the goal of making the wafer absolutely flat because the polishing pad would not be flat. The same result would occur if the polishing pad were initially bent (analogous to the inherent bend in the wafer described by Horowitz). If both the polishing pad and the platen are flat as required for planarization in Applicant's invention, then the electrostatic chuck assembly taught by Horowitz would not operate to grip the pad to the platen because the design taught by Horowitz requires a deformation in the surface to transmit the electrostatic attraction between the wafer and the chuck. Accordingly, if anything, Horowitz would teach away from implementing an electrostatic means of releaseably attaching a polishing pad to a platen for CMP because such an implementation would frustrate the goals of planarization or would cause a non-functional grip, or at least result in an insufficient gripping force to resist the forces of friction inherent to the CMP process.

The Claims And The Rejections Thereof. Turning now to the specific claim language, patentable differences between the cited references and the disclosed embodiments of the present invention will be pointed out. Claim 89 recites in pertinent part, "...applying a signal to the platen that produces *an electrostatic attractive force between the platen and the planarizing medium*." (Emphasis added). As noted above, the cited references do not disclose or even fairly suggest removably attaching the polishing pad by producing an electrostatic attractive force between the polishing pad and the platen. The electrostatic chuck disclosed by Horowitz would actually teach away from implementation in a planarization process due to deformation problems. In addition, as also noted above, electrostatic and electromagnetic forces cannot reasonably be regarded as equivalents as asserted by the Examiner. Claim 89 is therefore allowable over the cited art.

The claims that depend from claim 89 are similarly allowable based upon the allowability of the base claim and further in view of the additional limitations present in the dependent claims.

Claim 100 recites in pertinent part, "...*distributing a plurality of conductive*

particles in the planarizing medium...and...applying a signal to the platen that produces an electromagnetic attractive force between the platen and the conductive particles in the planarizing medium." (Emphasis added). The Examiner has completely overlooked the italicized element. None of the cited art disclose, or even fairly suggest a distribution of conductive particles in the planarizing medium. Instead, Bowman and Crevasse disclose a plurality of electromagnetic elements positioned within a platen that attract a top plate member comprised of a magnetic material. The polishing pad is then positioned onto the top plate member. Claim 100 is therefore allowable over the cited references at least on these grounds.

The claims that depend from claim 100 are similarly allowable based upon the allowability of the base claim and further in view of the additional limitations present in the dependent claims.

Claim 107 similarly recites in pertinent part, "A method for releasably attaching *a planarizing medium having a plurality of internally distributed conductive particles* to a platen of a planarization machine, comprising...positioning the planarization medium adjacent to the platen...and...coupling a signal to the platen *to produce an electromagnetic attractive force between the conductive particles and the platen."* (Emphasis added). Again, none of the applied references disclose or even fairly suggest the italicized elements. Claim 107 is therefore allowable over the cited references.

Further, claims that depend from claim 107 are similarly allowable based upon the allowability of the base claim and further in view of the additional limitations present in the dependent claims.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a timely Notice of Allowance are earnestly solicited.

Respectfully submitted,

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